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The effect of mesoporous structure of different mesoporous silica prepared from rice husk with potential application in contaminants removals

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During recent years, a persistent interest of researchers has been in the possibility of developing new, safe, non-toxic, and environmentally sustainable materials using waste and more environmentally friendly processes. Recently, a large part of the research has been focused on the efficient use of biomass to produce engineering materials and value-added products. The crop residues represent one of the largest biomass resources globally. Among them, rice husk (RH) is an abundant and sustainable waste biomass available in the world. These wastes often are discarded or burn for energy recovery, producing rice husk ash, causing great environmental problems for disposal. Thus, rice husk ash (RHA) presents over 80 wt.% of silica. This makes possible to use RH as an alternative cheap source of amorphous silica for the production of silicon-based materials. The most common types of silica materials in the mesoporous pore size range are MCM-41 and SBA-15, with hexagonal pore structure, which have been applied as supports for various catalytic active species due to their high specific areas and pore volumes.

The main objective of the present work was synthesizing siliceous mesoporous materials (MCM-41 and SBA-15) using a commercial organic silica and a natural, non-toxic, and cheap source of silica. This last synthesis methodology is effective, simple, and more environmentally friendly. The pure silica supports were modified with different loadings of Fe and a multi-technique characterization was employed. The chemical and physic properties of mesoporous solids synthesized from rice husk were similar to those of supports synthesized from commercial silica by conventional method.

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